NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION WATER CONVEYANCE ALUMINUM TUBING PIPELINE

(ft.)
CODE 430AA

DEFINITION

A pipeline and appurtenances installed in an irrigation system.

PURPOSE

To prevent erosion or loss of water quality or damage to land, to make possible proper water use, and to reduce water conveyance losses.

CONDITIONS WHERE PRACTICE APPLIES

All pipelines shall be planned and located to serve as an integral part of an irrigation water distribution system designed to facilitate the conservation of water on a farm or group of farms.

All areas served by the pipelines shall be suitable for irrigation with available water supplies.

CRITERIA

Laws and regulations. This practice must conform to all federal, state and local laws and regulations. Laws and regulations of particular concern include those involving water rights, property easements, wetlands, preservation of cultural resources, and endangered species.

Polluted liquids may not be discharged to Waters of the US at any time during start-up, operation, or shut down.

Working pressure. Maximum permissible working pressure in the line shall be determined by the following equation:

$$P = 2 S t / d$$

S = 7,500 pounds per square inch
P = Maximum working pressure in lb/in.^{2}
d = Inside diameter of tube in inches
t = Tube nominal wall thickness in inches

Capacity. Design capacity shall be based on whichever of the following is greater:

1. The capacity shall meet the peak consumptive use of the crop.
2. The capacity shall be adequate for all planned irrigation methods.

The design value of Manning's **n** shall be 0.01, except where joints, connections, and condition of the pipe require a higher value.

Stands for low-pressure lines open to the atmosphere. Stands shall be used where water enters the pipeline to control pressure, avoid entrapment of air; and reduce vacuum and surge pressures. Design the stand as follows:

1. Allow a minimum of one foot of freeboard. Stand height above centerline of pipeline must not exceed maximum working head of the pipe.
2. The top of each stand must be at least four feet above ground surface except for surface gravity inlets provided with trash racks and covers.
3. Downward water velocity in stands must not exceed two feet/second.

Stand inside diameter shall not be less than pipeline inside diameter except portions of the stand located more than one foot above the top of the upper inlet may have reduced cross sectional area. This reduced cross section must be capable of passing the entire flow at less than 10 feet/second velocity.

If inlet pipe flow velocity exceeds three times outlet velocity, centerline of the inlet shall have a minimum vertical offset from centerline of the outlet at least equal to the sum of the inlet and outlet pipe diameters.

Sand traps, when combined with a stand, shall have a 30-inch minimum inside dimension and a bottom located at least 24 inches below the outlet pipe invert. Sand trap downward flow velocity shall not exceed 0.25 feet/second. Provide for cleaning the sand trap.

The dimensions of gate stands shall be adequate to accommodate the gates and shall be large enough to make the gates accessible for repair.

Size the float valve stand to provide accessibility for maintenance and to dampen surge.

The design must prevent pump discharge pipe vibration from reaching the stand.

Vents for low-pressure lines open to the atmosphere. Vents must be provided to remove air and prevent vacuum collapse. Vents shall:

1. Have a minimum freeboard of one foot above hydraulic gradeline. Maximum height of the vent above pipe centerline must not exceed the maximum working head of the pipe.
2. Have a cross section area at least one-half the pipeline cross section area for a height of at least one pipeline diameter above pipeline centerline. Above this elevation, the vent diameter may be reduced to two inches.
3. Vents shall be located:

   At the downstream end of each lateral;
   At summits in the line;
   At downward flow grade changes greater than 10 degrees;
   Immediately below the pump stand if downward velocity in the stand exceeds one foot/second.
4. A combined air-release-vacuum-release valve may be used instead of an open vent. For lines 6 inches or less in diameter, 2-inch valves shall be used; for 7- through 10-inch lines, use 3-inch valves; and for 12-inch lines, use 4-inch valves.

Outlets. Outlets shall have capacity to deliver the required flow to the hydraulic gradeline of a pipe or ditch or to a point at least six inches above the field surface as appropriate.

Drainage. Provision shall be made to completely drain the pipeline. Where gravity discharge points are unavailable, provision shall be made to empty the line by pumping.

Check, pressure-relief, and air-and vacuum-release valves for high-pressure closed systems. A check valve shall be installed between the pump discharge and the pipeline if detrimental backflow may occur.

A pressure-relief valve shall be installed at the pump location if excessive pressure can build up when all valves are closed. Also, a surge chamber or pressure-relief valve shall be installed in closed systems in which a check valve protects the line from reversal of flow and excessive surge pressure may develop. Pressure-relief valves shall be no smaller than one-quarter inch nominal size for each pipeline diameter inch and shall be set at a maximum of five pounds/square inch above the pressure rating of the pipe. If needed to relieve surge, pressure-relief valves or surge chambers shall be installed at the end of the pipeline.

Air-release and vacuum-release valves shall be placed at all summits in the pipeline and at the end of the line if needed to provide a positive means of air release or escape. At least ½ inch nominal diameter air-release and vacuum-release valve outlets shall be used in lines 4 inches or less in diameter, at least 1 inch outlets in lines 5-to-8-inch in diameter, and at least 2-inch outlets in lines 10-to-6-inch in diameter.

Joints and connections. Connections must withstand working pressure of the line without leakage and leave the inside of the line free of obstructions that can reduce line capacity below design requirements. Fittings such as risers, ells, tees, and reducers should be of similar metal. If dissimilar metals are used, the fittings shall be protected against galvanic corrosion. For example, dissimilar metals may be separated with a rubber or plastic insulator. The connection between the pump discharge pipe and the aluminum line shall be made of rubber, plastic, or similar insulating material.

Quality of water. Water-quality tests shall be made for all aluminum pipeline installations. A copper content in excess of 0.02 p/m produces nodular pitting and rapid deterioration of the pipe if water is allowed to remain stagnant.

Materials. Pipe and coating materials must withstand the site conditions for the design life.

Thrust control. Abrupt changes in pipeline grade, horizontal alignment, or reduction in size, require anchor or thrust blocks to absorb axial thrust of the pipeline.

PLANS AND SPECIFICATIONS

Plans and specifications for constructing aluminum tubing irrigation pipelines shall meet this standard and shall describe the requirements needed to achieve the purposes.

OPERATION AND MAINTENANCE (O&M)

An O&M plan must be prepared for use by the owner/operator. The plan must provide specific instructions for operating and maintaining the system to insure that it functions properly. Provide for periodic inspections and repair or replacement of damaged components.